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BUCKWHEAT

J. L. STONE



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BEVERLY T. GALLOWAY, DEAN OF THE COLLEGE

SUPERVISOR, COURSE FOR
THE FARM

ROYAL GILKEY

BUCKWHEAT

J. L. STONE

Buckwheat is the least important in respect to quantity produced of the six principal grain crops of the United States. The cultivation of buckwheat in the United States is practically limited to the northern States that lie east of the Mississippi River.

The highest point in buckwheat production in the United States seems to have been reached in 1866, when the crop as reported by the United States Department of Agriculture was 22,791,839 bushels. The average crop for the five years 1866 to 1870 was 18,257,428 bushels. The average crop for the five years 1911 to 1915 was 16,642,200 bushels. While the total production in the United States has not in recent years equalled that of the sixties, the crop in the States of chief production has increased in volume. New York and Pennsylvania now produce more than two-thirds of the total crop of the United States. Michigan, West Virginia, Virginia, and Maine follow in the order named. The following table gives the statistics of buckwheat production in the United States and in New York and Pennsylvania for the five-years period from 1911 to 1915:

TABLE 1. THE PRODUCTION OF BUCKWHEAT IN THE UNITED STATES AND IN NEW YORK AND PENNSYLVANIA FOR THE PERIOD OF 1911-1915

	Acreage	Yield per acre (bushels)	Total production (bushels)	Price per bushel on Decem- ber 1 (cents)	Farm value on December 1
United States.....	815,400	20.4	16,642,000	73.9	\$12,240,000
New York.....	278,200	20.3	5,636,600	74.3	4,173,000
Pennsylvania.....	286,200	21.2	6,090,400	71.3	4,341,000

In States of chief production the legal weight of buckwheat is forty-eight pounds per bushel. In some others it varies from forty to fifty-six pounds.

The name *buckwheat* seems to be a corruption of the German *buchweizen*, meaning beech wheat, which was given to the plant because the shape of the seeds is similar to that of the beechnut, while their food constituents are similar to those of wheat grains. Botanically buckwheat is not a cereal, but, since its seeds serve the same purposes as the cereal grains, it is usually classed in market reports among the cereals. The family to which buckwheat belongs includes several well-known troublesome weeds, such as sorrel, dock, smartweed, knotweed, and bindweed.

Buckwheat is an annual of erect habit, under ordinary conditions attaining about three feet in height. The root system consists of one primary root and several branches, the former extending well downward to

reach moist earth, but the total development of roots is not large. The stem varies from one-fourth to five-eighths inch in diameter and from green to purplish red in color while fresh, and changes to brown at maturity. Only one stem is produced from each seed; the plant, instead of tillering, or producing suckers, branches more or less freely, depending on the thickness of seeding. It thus adapts itself to its environment even more completely than the cereals, which tiller freely.

The buckwheat crop is unusually free from interference from weeds or plant diseases. It starts so quickly and grows so rapidly that most weeds get no chance to make headway against it. In fact, buckwheat is one of the best crops for cleaning land by smothering out weed growths. Wild as well as domestic birds are fond of the grain and when abundant sometimes cause considerable loss. No insect or fungous troubles have been sufficiently destructive to attract much attention.

COMPOSITION

The following table, compiled by Professor T. F. Hunt, in *The Cereals in America*, shows the composition of the grain, straw, flour, middlings, and hulls of buckwheat:

	Grain	Straw	Flour	Middlings	Hulls
Number of analyses.....	8	3	4	6	3
Water.....	12.6	9.9	14.6	12.7	10.1
Ash.....	2.0	5.5	1.0	5.1	2.0
Protein (Nx6.25).....	10.0	5.2	6.9	28.1	4.6
Crude fiber.....	8.7	43.0	.3	4.2	44.7
Nitrogen-free extract.....	64.5	35.1	75.8	42.4	37.7
Fat.....	2.2	1.3	1.4	7.0	.9

Owing to its thick heavy hull, buckwheat contains a larger percentage of crude fiber than the cereal grains. The percentage of protein and nitrogen-free extract is somewhat lower than in the case of wheat. Buckwheat flour contains only about two-thirds as much protein as wheat flour. The straw of buckwheat contains a somewhat higher percentage of protein and crude fiber and a lower percentage of nitrogen-free extract than wheat straw. Buckwheat middlings, on account of its higher percentage of protein and fat, is in great demand as a food for dairy cows. The hulls are so hard and indigestible that they are not often used for animal food, although the analyses would suggest that they have some feeding value.

KINDS OF BUCKWHEAT

Botanists have assigned the cultivated forms of buckwheat to three distinct species: Common, or true, buckwheat (*Fagopyrum esculentum*);

notch-seeded buckwheat (*F. emarginatum*); Tartary, or Siberian, buckwheat (*F. tataricum*).

The common buckwheat is the most valuable and most widely cultivated form. It grows wild in China and Siberia and enters into the agriculture of every country where grain crops are cultivated. In China it has been grown and used for food from time immemorial. In Japan it is held in general esteem, and in Russia it is also largely consumed. It has been cultivated for centuries in England, France, Spain, Italy, and Germany. In all the European countries it is chiefly consumed by the poorer classes, but it has remained for the American housewife to learn how to prepare it so as to please the palate of the epicure. The buckwheat pancake is a peculiarly American institution. Formerly it constituted the major part of the bread diet of the greater portion of the rural population of the New England and Middle States during the winter season. It has now won its way to the breakfast table of the city resident as well, and when served hot with maple sirup is considered the peer of the finest productions of the French chef.

The Tartary buckwheat, sometimes called India wheat and duckwheat, is cultivated in the somewhat cool and mountainous regions of Asia and to some extent in Canada, Maine, and New York. It is recommended for its superior hardiness. It has been tried in Pennsylvania but without satisfactory results. The grain is smaller than that of the common buckwheat, the plants are more slender, and the leaves arrow-shaped and smaller. The flour made from Tartary buckwheat is dark colored but is said to be as palatable and nutritious as that made from the common kind. The true buckwheat has bright, white or pink-tinged flowers in large trusses, or heads; the India wheat has smaller greenish white flowers in small heads. The grain of buckwheat has regular angles; that of the India wheat has wavy or slightly notched angles.

The notch-seeded buckwheat is not known to have been grown in this country but is reported as being cultivated in India and China. By some botanists it is regarded as a form of the common buckwheat. It is distinguished by having the angles of the hull extended into wide margins, or wings.

CULTIVATION OF BUCKWHEAT

A moist, cool climate is most favorable for buckwheat, although the seeds will germinate in very dry soil, and considerable heat in the early stages of growth is an advantage. High temperatures during the period of seed formation, especially hot sunshine following showers, are usually disastrous to the crop yield, causing blasting of the flowers. The same effect is attributed to strong east winds. The yield is much reduced by drought during this period. Buckwheat will mature in a shorter period than any

other grain crop, eight or ten weeks being sufficient under favorable conditions. It is thus well adapted to high altitudes and short seasons, but its period of growth must be free from frosts as the plants are very sensitive to cold.

SOIL

Buckwheat will grow on a wide range of soils, but those of a rather light, well-drained character are best suited. It will give fair yields on soils too poor or too badly tilled to produce most other crops and seems to be less affected by soil than by season. It is not desirable, however,

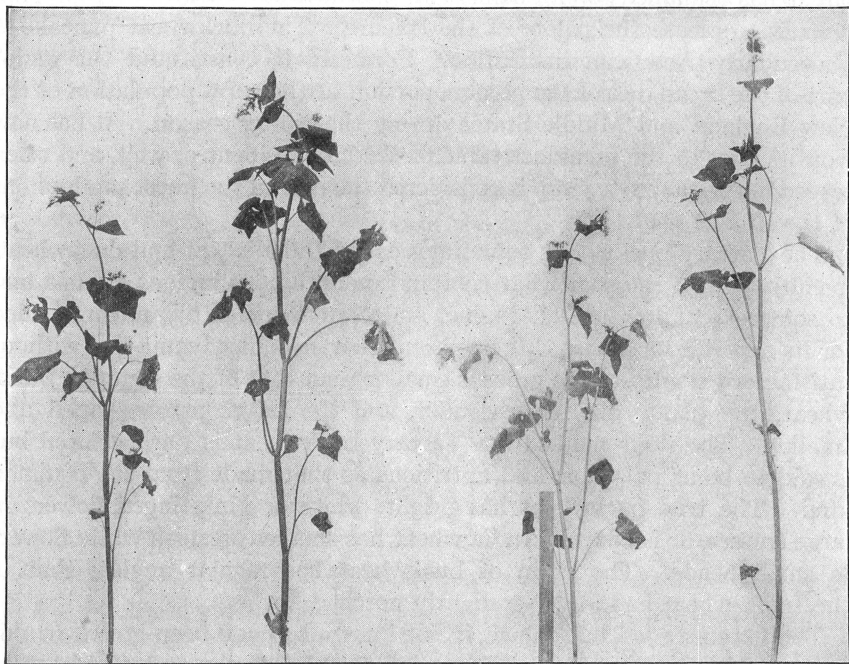


FIG. 60. REPRESENTATIVE PLANTS FROM AN EARLY PLOWED FIELD ON THE LEFT, AND FROM A LATE PLOWED FIELD ON THE RIGHT

to attempt to grow buckwheat on very rich land, as under such conditions the crop often lodges badly with results even more serious than those that occur when other grain crops go down, for buckwheat has no method of rising again. This ability to produce fair crops on poor soils and under indifferent cultivation has led to buckwheat's being often considered the poor farmer's crop, and to poor and unskilled farmers being dubbed "buckwheaters." The crop lends itself well to the farmer who lacks capital to obtain timely labor or to wait for returns on investments in tillage and fertilizer. It may be planted after the rush of spring work is over; it may be resorted to as a substitute for spring crops or meadows that have

failed; and it brings quick return for investment in fertilizers. One farmer is reported as saying: "I like to raise buckwheat because it is the only grain for which I can buy fertilizer on a 90-day note and pay for it out of the crop it makes." Buckwheat, however, responds to more generous and intelligent treatment and deserves to be held in higher esteem than it usually enjoys.

It should be kept in mind that in the States of chief production buckwheat is grown mostly in the areas having poor, acid soils, not good enough to grow such exacting crops as wheat, barley, clover, and alfalfa. Nevertheless the acre value of buckwheat in the United States and in the several States makes a good showing in comparison with the acre value of other

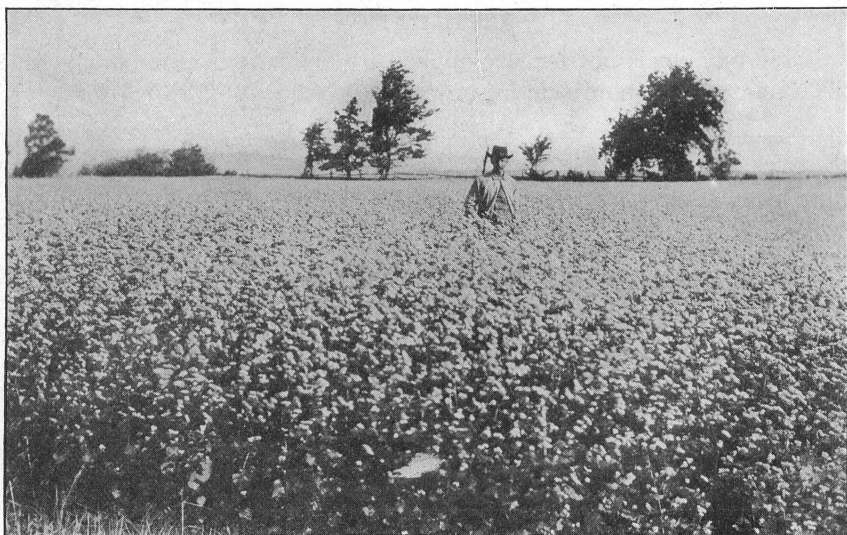


FIG. 61. RESULT OF EARLY PLOWING AND THOROUGH PREPARATION OF THE SOIL

standard crops. The economic importance that the crop has for these regions is shown in table 2, compiled from the December, 1915, crop report of the United States Department of Agriculture.

TABLE 2. AVERAGE VALUE PER ACRE, BASIS PRICE ON DECEMBER 1, OF WHEAT, OATS, RYE, BARLEY, FLAXSEED, AND BUCKWHEAT FOR 1913-1915

	Penn- sylvania	New York	Mich- igan	Minne- sota	Kansas	United States
Wheat.....	17.84	22.72	18.47	12.81	13.62	14.70
Oats.....	15.43	16.67	13.83	12.35	10.88	12.68
Rye.....	14.34	15.35	13.30	13.88	12.88	13.09
Barley.....	20.06	20.77	16.69	12.88	9.66	14.45
Flaxseed.....				13.82	7.57	12.44
Buckwheat.....	15.15	14.87	11.36	11.86	12.09	14.88

Since buckwheat is not usually planted until the last of June, owing to pressure of other work, the land too often is not plowed until just before seeding and then receives hasty and indifferent preparation. This allows little time for sods and other organic matter to decay and become incorporated with the soil, and capillarity is not reestablished between the subsoil and the seed bed. Under these conditions, the development of the crop is slow, and, if drought ensues, disaster is the result. The land should be plowed early, harrowed several times at intervals of two weeks, and allowed to settle thoroughly. If early plowing is impracticable, then the greater attention should be given to thorough preparation of the seed bed (Figs. 60, 61, and 62).

FERTILIZATION

Stable manure is not usually applied to land intended for buckwheat, but is reserved for more exacting crops. Moderate applications of manure,



FIG. 62. RESULTS OF LATE PLOWING AND HASTY PREPARATION OF THE SOIL ON LAND ADJOINING AND SIMILAR TO THAT SHOWN IN FIGURE 61

however, on poor soils result in largely increased yields. Buckwheat when grown on poor soil, responds well to moderate dressings of even low-grade fertilizers, and many farmers who do not use fertilizers on other crops find it profitable to buy for this.

SEEDING

The amount of seed used per acre for buckwheat varies from three to five pecks but is usually four pecks. It may be sown with the ordinary grain drill or broadcasted and harrowed in.

The time of seeding varies in different localities, but in New York and Pennsylvania is the last week in June or the first week in July. In order to avoid hot weather while the grain is forming, it is desirable to sow as

late as possible and have the crop well developed before severe frosts occur. Buckwheat begins to bloom before the plants have nearly reached full growth and continues blooming until stopped by frost or harvest. Hence there will be at harvest time on the same plants mature and immature grain and flowers. It is sought to cut the crop just before the first hard frost. Much of the immature grain will ripen while lying in the swath or the gavel.

HARVESTING

Buckwheat is rarely harvested with the self-binder, but may be cut with the hand cradle or the dropper reaper. To avoid shelling and



FIG. 63. BUCKWHEAT IN STOOK ON THE CORNELL UNIVERSITY FARM

loss of the more mature grains it is preferably cut early in the morning while damp from dew or during damp, cloudy weather. It is usually allowed to lie a few days in swath or gavel, when it is set up in small independent shocks, or stooks, also preferably when the grain is damp. It is not bound tightly by bands as are most cereal grains, but the tops of the shocks are held together by a few stems being twisted around in a way peculiar to the crop.

Buckwheat is generally threshed direct from the field without being stored in barns or stacked. Formerly much of the threshing was done with the hand flail, in which case it was necessary that the work be per-

formed on a dry airy day so that the grain would shell easily. If threshed by machinery, neither crop nor day need be so dry. It is usual to remove from the thresher the spiked concave and put in its place a smooth one or a suitable piece of hardwood plank. This is to avoid cracking the grain and unnecessarily breaking the straw. The stems bearing the seeds are slender, and these, as well as the straw, when dry, are brittle so that buckwheat threshes much easier than the cereals.

ROTATION

Buckwheat usually has no definite place in the rotation of crops. This

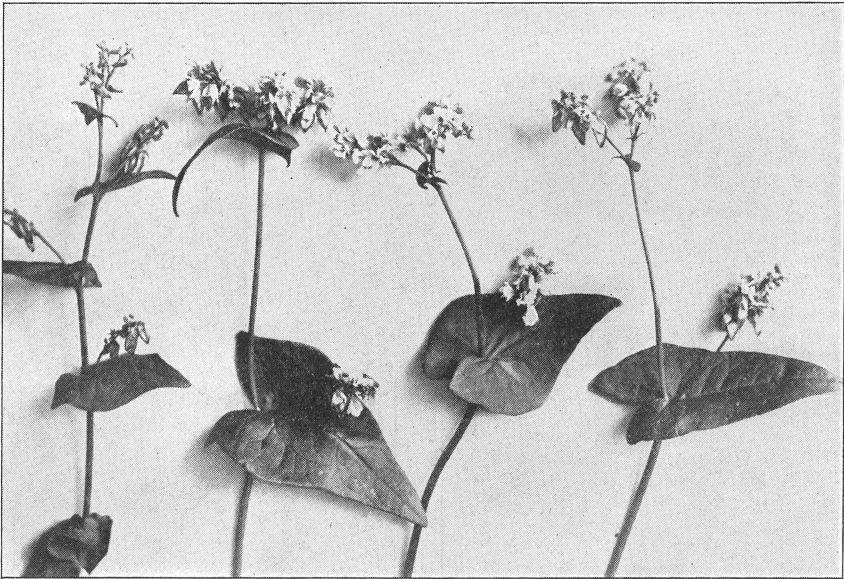


FIG. 64. BUCKWHEAT IN BLOOM

Beginning at the left: India wheat; three varieties of common buckwheat, Silver Hull, Common Gray, and Japanese

is chiefly due to its being used as a substitute for meadow or spring-planted crops that have failed. The poorer lands and the left-over fields are usually sown to buckwheat. While buckwheat seems not to be materially affected by the crop that precedes it, on the other hand it is reported to affect unfavorably certain crops when they follow it. Oats and corn are said by many to be less successful after buckwheat than after other crops. That this is so has not been established by any experiment station. Buckwheat leaves the soil in a peculiarly mellow, ashy condition. In the case of rather heavy soils on which it is desired to grow potatoes, this is a decided benefit, and in some localities the practice of preceding potatoes

by buckwheat, for the purpose of obtaining this effect, has come to be common. The following rotation is sometimes recommended for such soils: clover, buckwheat, potatoes, oats or wheat with clover. The first crop of clover is harvested early, and the land is immediately plowed and sown to buckwheat as a preparation for potatoes.

VARIETIES

There are three principal varieties of buckwheat grown in America: Common Gray, Silver Hull, and Japanese. The seed of Silver Hull is slightly smaller and the color is lighter than that of Common Gray; it also

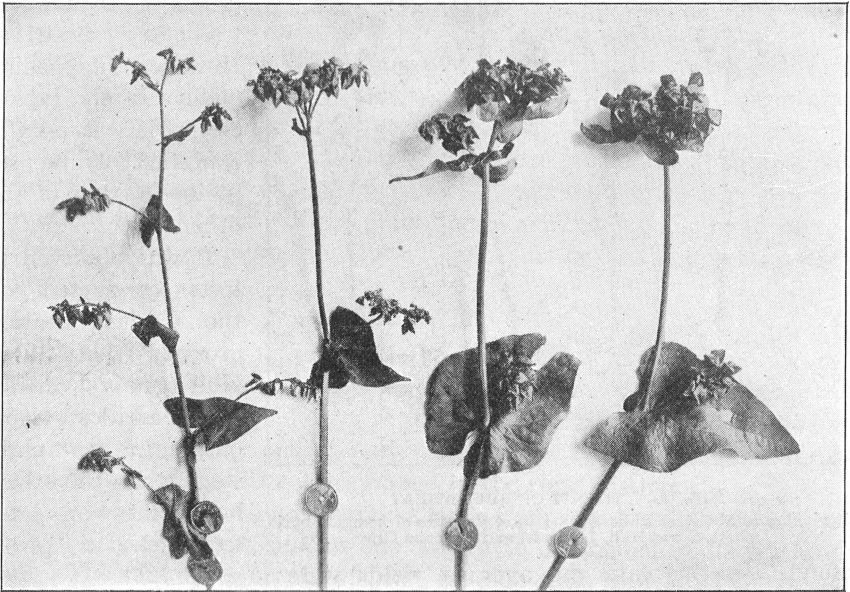


FIG. 65. BUCKWHEAT IN SEED

Beginning at the left: India wheat; three varieties of common buckwheat, Silver Hull, Common Gray, and Japanese

has a glossy, silvery appearance. The Japanese is larger and somewhat darker than the Gray, and there is a tendency for the edges of the hull to extend into a wing, making the faces of the grain more concave. The Japanese variety is somewhat thriftier than the others, the fresh stem has a green color, and the flowers seem not to be so subject to blasting from hot sunshine as the others. On this account it is recommended in some localities to sow the Silver Hull and Japanese varieties mixed, it being said that the later and hardier Japanese will shade and protect the other from hot sunshine, thus avoiding blasting and obtaining a larger zone of seed-bearing straw than is furnished by either sort alone, a larger

yield resulting. The Silver Hull has a red stem, and branches more freely than the others. The leaves also are smaller.

Each of these varieties has produced largest yield in certain cooperative

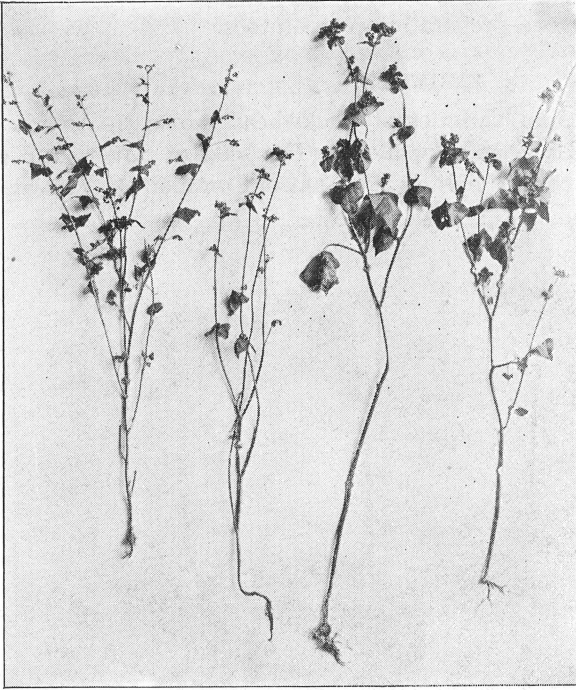


FIG. 66. PLANTS OF BUCKWHEAT

Beginning at the left: India wheat; three varieties of common buckwheat, Silver Hull, Japanese, and Common Gray

tests. It seems that there is adaptation of variety to soil or climate or, perhaps, to weather conditions that has not yet been worked out, that produces these contradictory results. However, the yielding quality of the Japanese variety is usually conceded to be superior to that of the others.

It was observed in tests conducted on the Cornell Station grounds that Silver Hull grows much slower and less vigorously in its early stages than the others but comes on later to make a good

stand. In this case the average yields were:

Japanese.....	27.5 bushels per acre
Common Gray.....	26.8 bushels per acre
Silver Hull.....	19.5 bushels per acre

In another experiment there were eleven plats seeded with Japanese buckwheat and eleven with Silver Hull. All the plats were fertilized and treated exactly alike. The average yield of the eleven plats sown to Japanese was 36.6 bushels per acre and of the eleven sown to Silver Hull was 23.1 bushels per acre. Probably these figures are unfair to the Silver Hull, as apparently the east end of the field was less productive than the west end where the Japanese was grown, though there was nothing to indicate this in the appearance of the soil.

Records of the yield of buckwheat grown on seventy-eight farms in Franklin and Clinton Counties were recently obtained. The average

yields of the three varieties and the average yields of potatoes on each group of farms growing a given variety of buckwheat, are shown in table 3.

TABLE 3. RELATION OF VARIETY OF BUCKWHEAT TO YIELD

Variety of buckwheat	Number of farms	Average yield of potatoes	Average yield of buckwheat	Percentage of crop acres in buckwheat
Common.....	40	171.0	15.3	5
Silver Hull.....	35	157.0	16.7	4
Japanese.....	3	166.5	19.1	3

Formerly the flouring qualities of the Japanese variety were pronounced by many millers to be inferior to the other sorts, and not infrequently the price of Japanese buckwheat was five or ten cents per bushel less than the others. In some localities this condition still prevails; in others the reverse is true. In parts of Seneca County in recent seasons the millers have offered a bonus of five cents per bushel for the Japanese variety. Whether this change in the estimate of the variety is due to improvement in the quality of the grain due to acclimatization, or to better adaptation of the milling methods to the variety has not been ascertained.

CONSUMPTION

Formerly a considerable part of the buckwheat was used for animal food, only enough flour being manufactured to meet the requirements of the rural districts during the winter season. Of late the demand for the flour in the cities has been such that most of the grain is ground for flour, and less of the flour is consumed in the rural districts.

Buckwheat flour is whiter than that made from wheat and has a peculiar mealy consistency that enables one readily to distinguish it from wheat flour. The first flour on the market after harvest brings a high price, but the price rapidly declines as the supply increases. The grain must be well dried and the grinding performed in cool dry weather to obtain best results in milling. The yield of flour per bushel of buckwheat is usually about twenty-five pounds, though twenty-eight or more may be obtained if the grain is plump and very dry. The middlings, a by-product of the flouring process, are much sought by dairymen as food for dairy cows on account of the high content of protein. The hulls have little or no value. Sometimes they are ground and used as an adulterant for black pepper.

Buckwheat grain is much relished by poultry and has a reputation of being of special value in egg production. In feeding experiments this reputation is scarcely sustained.

MINOR USES FOR BUCKWHEAT

A number of farmers have reported favorably on the use of buckwheat as a soiling crop, but its use for this purpose has not been sufficiently extended to establish its value.

The use of buckwheat as a green manure has been much more extended. It possesses several characteristics that adapt it to this purpose. It thrives on rather poor soil; it grows rapidly; it smothers out weeds, thus helping to clean the land; it leaves hard soils in a remarkably mellow condition; it decays quickly when plowed under.

Buckwheat has sometimes been used in connection with rye for the improvement of land that has become so depleted that it is difficult to get a catch of hay seeds and that it is not practicable to manure. The buckwheat and the rye are sown together late in June — the buckwheat thinly, the rye rather thickly. They both start, but the buckwheat overgrows the rye, which remains small, like timothy growing under oats. When the buckwheat is harvested, the rye springs into growth and during fall and spring produces a considerable amount of green matter, which is plowed under early in June. The crop of buckwheat is expected to pay the expense of the undertaking, and the green manure plowed under to improve the soil. Several instances are related where this has been followed on the same land for several seasons with increasing crops of buckwheat for the harvest and increasing growth of green manure for the benefit of the soil. After a few seasons of such treatment the land can usually be successfully seeded to clover and timothy. A dressing of lime at this time usually makes a catch of clover more certain.

READING COURSES IN VEGETABLE GARDENING

In New York State there are nearly two hundred thousand farms that have vegetable gardens. The average size of these gardens per farm is three-tenths of an acre, and the average value per farm, as reported by the United States Census Bureau, is \$15.32. The returns per farm garden may well be increased, especially since the farmer, as a general rule, does not buy vegetables but uses only what he raises. From fifty to seventy-five dollars in value may be returned from this amount of land given over to the growing of vegetables. Better knowledge of the culture of vegetables will serve to increase the returns from farm gardens, from home gardens in the town, and from commercial gardens.

In order to meet the needs of persons who desire to obtain a better knowledge of vegetable gardening, the Cornell Reading Course for the Farm offers two home study courses on vegetable gardening. The reading course lessons on vegetable gardening aim to meet the needs of farmers and home gardeners. The following series of four lessons will be sent

free to residents of the State on application: *Planting the Home Vegetable Garden, Vegetable Gardening, Raising Vegetables for Canning, Summer Care of the Home Vegetable Garden*. An advanced reading course in vegetable gardening, similar to a correspondence course, is also offered on commercial vegetable gardening. The principles and practices discussed will prove helpful to farmers and home gardeners as well as to commercial growers. The advanced course is composed of sixty-one lessons, thirty-six of which offer brief, complete discussions on as many different vegetables, making the course thorough and practical. The only expense connected with the advanced reading course in vegetable gardening is the purchase of a standard textbook, not published by the College of Agriculture. Sets of questions are provided on the text, and the answers are corrected and graded by the Department of Vegetable Gardening of the College, and returned to the reader with suggestions.

READING COURSES IN FRUIT GROWING

Owing to the requirements of the Apple Packing Law of 1914, fruit growers are taking a greater interest in producing a good grade of fruit, free from all blemishes. For those who desire to make a study of the most successful orchard practices, home study courses are offered by the Cornell Reading Course for the Farm. Six reading course lessons are available on the following subjects: *Pruning, Insects Injurious to the Fruit of the Apple, Culture of Red and Black Raspberries and of Purple-cane Varieties, Culture of the Cherry, Culture of the Blackberry, Culture of the Grape*. These lessons aim to meet the needs of farmers who desire to become more fully informed along particular lines, as well as of persons who are not familiar with the subjects treated. When it is realized that one insect alone, the codling moth, often causes a loss of from one-fourth to one-half of the apple crop in the unprotected orchards of New York State, the importance of a study of fruit growing is understood.

An advanced reading course in fruit growing has been arranged for readers who desire to make a more complete study of fruit growing than is possible by means of the available reading course lessons. This course is conducted by means of a textbook and through correspondence, which is reviewed by the Department of Pomology of the College of Agriculture. Each member of the course receives grades for his work together with helpful suggestions. The only expense connected with the course is the purchase of a textbook, not published by the College. Some of the important subjects treated in the course are as follows: selecting varieties, orchard culture, fertilizers, cover crops, pruning, orchard insects, diseases of fruit trees, spraying, renovating old orchards, picking and handling fruit, storing fruit, marketing, and advertising.

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